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RESEARCH ARTICLE

An Analysis of Unvaccinated College Students' HPV and HPV Vaccine Knowledge and Preferred Information Source

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Abstract

Receiving accurate human papillomavirus (HPV)/HPV vaccination information from a trusted source coupled with adequate HPV/HPV vaccination knowledge may increase college students' likelihood to be vaccinated. This elicitation study, grounded in the information construct of the information–motivation–behavioral skills model, used a nonexperimental design with a convenience sample of 114 unvaccinated college students to assess HPV and HPV vaccine knowledge, desire for more information, and preferred source of HPV vaccine information. The sample answered slightly over half (58%) of questions related to knowledge of HPV correctly, 63% of the questions related to HPV vaccine knowledge correctly, and one-third (36%) wanted more information about the HPV vaccine. Their preferred sources were primary care provider, health educator, and parent(s). Interventions targeting unvaccinated college students should aim to increase HPV and HPV vaccine knowledge and encourage preferred sources to communicate this information.

Introduction

Human papillomavirus (HPV) is the most common sexually transmitted infection in the United States, with about one in four people infected (Centers for Disease Control and Prevention [CDC], 2018). HPV is transmitted via skin to skin contact during oral, anal, or vaginal sex. HPV infections can lead to a variety of health problems, including genital warts and cancers of the cervix, vagina, vulva, penis, anus, back of the throat, including the base of the tongue and tonsils (CDC, 2018). Each year there are 24,000 incidences of HPV-related cancers. HPV is responsible for causing 91% of both cervical and anal cancers (CDC, 2018).

The primary reason college students are at risk for HPV infection is because many are or have been sexually active (American College Health Association [ACHA], 2018; Copen, Chandra, & Febo-Vazquez, 2016). Results from the Fall 2017 National College Health Assessment II (NCHA II) found that, in the last 12 months, nearly two-thirds (65.2%) of college students had engaged in oral, vaginal, or anal sex with one or more partners. Nearly half (45.1%) of college students had vaginal intercourse within the last 30 days. Slightly fewer (42.1%) reported having oral sex and anal sex was much lower with only 5.2% indicating that they participated in this act during the last 30 days (ACHA, 2018). Fortunately, a vaccine that protects against the most detrimental strains of HPV is available. The HPV vaccine was originally on the market in 2006 with Gardasil® (HPV4) and then in 2009 Cervarix® (HPV2) was introduced with each of these originally being available only to females (CDC, 2010). In the fall of 2016, Gardasil®9 gained approval for an updated vaccine (HPV9) which protects against nine strains of HPV and this is now the only vaccine available for males and females in the United States (U.S. Food and Drug Administration, 2017). Clinical trials have demonstrated close to 100% effectiveness in preventing genital warts and cervical cancers through the Gardasil®9 vaccine, which is given in a three dose series to individuals 15-45 years old and in only two doses for those 9 to 14 years of age (Meites, Kempe, & Markowitz, 2016; U.S. Food and Drug Administration, 2018).

College students are a priority population for catch up HPV vaccination for a few reasons. The first factor is related to their age. When the current generation of college students was at the recommended HPV vaccination age, the vaccine was still relatively new. Consequently, parents of now college-aged individuals were unaware of the vaccine, chose not to vaccinate their child due to the newness of the vaccine, or were uninformed about the vaccine (Reiter, McRee, Gottlieb, & Brewer, 2010). Parents of adolescent males indicated a low acceptance for the vaccine and low overall HPV knowledge (Khurana, Sipsma, & Caskey, 2015), which has also contributed to a low number of vaccinated college students. The Fall 2017 NCHA II found that 46% of college men and 61% of college women reported receiving at least one shot in the HPV vaccine series (ACHA, 2018). Overall, 55.7% ($n = 17,264$) of the sample reported receiving the HPV vaccine. While the number of college students who have at least started the vaccine series was determined, it is still unknown how many received the full series due to the wording of the survey item.

Second, college students have newly acquired independence from their parents (Von Ah, Ebert, Ngamvitroi, Park, & Kang 2004), making them more in control of their health and health decisions (National Foundation of Infectious Diseases, 2016). Specifically, a report by the National Foundation of Infectious Diseases (2016) found this true of college students and the flu vaccine, so it likely that this could be the case for other vaccines. Third, college students are known to engage in unsafe sexual behaviors such as inconsistent condom use and sex with multiple partners which exposes them to contracting and/or spreading HPV (CDC, 2015). Fourth, the original Gardasil® vaccine was not approved for males until four years after its approval for females, which may have contributed to lower HPV vaccination rates among college males.

Although college students are now eligible to receive the HPV vaccine, there is still an information deficit and it is unclear which information sources students prefer for learning more about HPV. Researchers have examined parent-doctor communication satisfaction (Kornides, Fontenot, McRee, Panozoo, & Gilkey, 2018) and what type of information mothers share about HPV with their daughters (McRee, Reiter, Gottlieb, & Brewer, 2011). Although mothers shared

information about the benefits, it was unclear if the daughters were open to these conversations (McRee, et al., 2011). Roberts, Gerrard, Reimer, and Gibbons (2010) found that the topics of discussion played a valuable role in increasing HPV vaccination uptake. They found that when mothers took a moralistic approach regarding HPV vaccination, women over the age of 18 were less likely to be vaccinated compared to when they discussed risks associated with sexual intercourse such as pregnancy or STIs (Roberts et al., 2010). Although these studies focused on the college population, there is still limited information on the communication channels preferred by college students. Katz, Krieger, and Roberto (2011) found that college males, their parents, and providers all needed improved communication skills to handle discussing HPV. The research team found that college males were embarrassed and lacked self-confidence when it came to discussing HPV with their parents. College males were also concerned about what would happen if their parents found out that they got vaccinated. This result demonstrates an opportunity for parents to have open discussions that reassure their college-age children that getting the HPV vaccine is a positive decision. Additionally, college students found it difficult to find time to discuss HPV with their physician, though they were open to the conversation (Katz et al., 2011). This finding presents primary care providers with the task of being the first to open the discussion on the topic.

The present elicitation study extends the current literature through an examination of unvaccinated college students' HPV/HPV vaccine knowledge, desire for HPV/HPV vaccination information, and preferred source of HPV vaccine information. An elicitation study is necessary to identify knowledge gaps and preferred messengers as these areas are currently underrepresented in the literature. The findings from this study can assist with the development of theoretically and empirically driven health communication campaigns and persuasive discourse surrounding HPV vaccination (Fisher, 2012).

HPV Knowledge

Understanding college students' knowledge about HPV/HPV vaccination is essential, as knowledge is an important factor that may influence college students' decision to receive the vaccine. HPV knowledge includes comprehension of facts about disease prevalence, symptoms, causes, risk factors, methods of transmission, health consequences, prevention strategies, and treatment options (Waller, Ostini, Marlow, McCaffery, & Zimet, 2013). HPV vaccine knowledge includes an understanding of diseases that the vaccine provides protection against, current HPV vaccine recommendations, and vaccines available (Waller et al., 2013).

Bendik, Mayo, and Parker (2011) reported a positive association between knowledge of HPV's consequences and HPV vaccine uptake. Similar findings with a population of college aged women in Greece indicated that those who had been vaccinated had higher HPV knowledge than their unvaccinated peers (Donadiki et al., 2013). Further, Obulaney, Gilliland, and Cassells (2016) found a significant increase in mothers' intentions to vaccinate their daughters against HPV after their knowledge level increased. The findings from studies on college students' HPV knowledge level have been mixed. Barnard, George, Perryman, and Wolff (2017) found college students to be quite knowledgeable in regard to how HPV is transmitted and that it can infect both males and females. Johnson and Ogletree (2017) found that male college students had some knowledge gaps but were still able to score around 50% on an HPV knowledge measure. Others found that males were unaware of the vaccines and/or their risks for genital warts or cancers

from HPV (Beshers, Murphy, Fix, & Mahoney, 2015; Rosenbloom & Killian, 2014; Staggers, Brann, & Maki, 2012).

In a study of college females, those who were vaccinated had greater awareness that HPV caused genital warts compared to the unvaccinated group (Sundstrom, Carr, DeMaria, Korte, Modesitt, & Young Pierce, 2015). This finding is in contrast to a study by Cohen and Head (2013) that found that both vaccinated and unvaccinated women had a lack of knowledge related to how HPV is spread and how to protect against HPV. A study involving vaccinated and unvaccinated college females found that both groups were equally unaware of the connection between HPV and genital warts or how HPV was transmitted (Ratanisiripong, Cheng, & Enriquez, 2013). Findings from studies assessing college student HPV/HPV vaccination knowledge are inconclusive.

Further, to the authors' knowledge, no studies have assessed college students' HPV and HPV vaccine knowledge using comprehensive items based on previously validated scales. It would, therefore, be beneficial to gain more understanding about what college students know about HPV/HPV vaccination and if they desire further information regarding HPV/HPV vaccination.

HPV Information Source

There are a variety of sources that young people use to gather information pertaining to HPV and the HPV vaccine. Barnard and colleagues (2017) asked male and female college students for their primary sources of HPV related information and men reported using the Internet and getting information from their school as the top sources. Women primarily received information from their healthcare providers and the second most popular source of information was their school (Barnard et al., 2017). In a study conducted by Cohen and Head (2013), vaccinated women ages 18-26 identified doctors as important sources of HPV information that influenced them to receive the vaccine. Vaccinated women reported being influenced by their social network of close females which could be sisters, teammates, or sorority sisters (Cohen & Head, 2013). The opposite was found for the unvaccinated women as they received negative information from their support system which discouraged them from being vaccinated (Cohen & Head, 2013). Although schools are rated as an important resource, a sample of 214 colleges and universities across the U.S. found that only half of the institutional websites provided information related to the HPV vaccine (Fontenot, Fantasia, Sutherland, & Lee-St. John, 2016).

Understanding college students' preference for HPV vaccination information delivery is an important element to creating an intervention that may increase HPV vaccination rates (Barnard et al., 2017). One potential concern for males is their lack of consistent interaction with their health care provider (Pitts, Stanley, & Kim, 2017). Although college males might not see their primary care provider regularly, one study found that they mentioned doctor as one of the respected information sources, along with their mother, and health class teacher (Johnson & Ogletree, 2017). Beshers et al. (2015) and Patel et al. (2013) found that college males and females indicated they would likely follow the guidance from their healthcare provider when it came to making decisions about the HPV vaccine. Other studies of college females revealed that physician approval (Gainforth, Cao, & Latimer-Cheung, 2012) and having a knowledgeable health care provider (Cohen & Head, 2013) played important roles in getting vaccinated. In a study conducted with college females who had received at least one shot in the series, 93%

indicated that physician recommendation was a contributing factor in vaccine series completion (Sundstrom et al., 2015).

Although some studies report which sources students have used to learn about HPV and the HPV vaccine in past, Patel et al. (2013) suggested that further work still needs to be done to determine the preferred sources of information prior to the creation of HPV related programs. Cohen and Head (2013) discussed the need for more information related to HPV knowledge gaps as well as an understanding of how to positively influence social networks, all of which would assist health campaign designers. Additionally, most of these studies focused on sub groups such as college females who had received at least one shot in the series, exclusively college females, or exclusively college males.

Information–Motivation–Behavioral Skills Model

The information–motivation–behavioral skills (IMB) model is a generalizable, social psychological approach to understand and promote health behavior (Fisher, Fisher, & Harman, 2003). Fisher and Fisher (1992, 2000) assert that three operational constructs, namely (a) health-related information, (b) motivation, and (c) behavioral skills are primary determinants of health behavior. That is to say, individuals who are well informed about a health promoting behavior, motivated to engage in that behavior, and hold the pre-requisite skills to perform that behavior are likely to initiate and maintain that behavior. The information construct, in particular, is essential and can have direct effects on health behavior (Fisher et al., 2003), including one's decision to receive the HPV vaccine or not (Allen et al., 2009; Allen et al., 2010; Brewer et al., 2011; Donadiki et al., 2013; Sundstrom et al., 2015). Fisher (2012) proposes utilization of an IMB model approach to promote HPV vaccine uptake.

As a first step to developing effective health promotion efforts, Fisher (2012) recommends conducting elicitation research to assess the priority population's HPV vaccine-related information, HPV vaccine motivation, and HPV vaccine-related behavioral skills. As a preliminary step in applying Fisher's (2012) recommendation, the current elicitation study was grounded in the information construct of the IMB model. The information construct consists of facts that are directly relevant to engaging in a health behavior (Fisher et al., 2003). When applying the information construct of the IMB model to HPV vaccination, Fisher (2012) recommends assessing the priority population's knowledge of HPV prevalence and incidence, transmission, and consequences, as well as easily translatable information about HPV vaccine acquisition.

The purpose of this study was to further understand college students' knowledge of HPV and the HPV vaccine in order to lay the groundwork for better testing the construct and its relationship to vaccination intention and uptake in future studies. Exploring college students' baseline level of knowledge and their preferred HPV information sources will inform follow-up studies. Messages can then be tested based on specific knowledge items with extra effort placed on the areas where college students have the least amount of HPV-related knowledge. These messages can be communicated through sources that are well-received by college students.

This study seeks to expand understanding of the college student population by specifically assessing unvaccinated college students': (a) current HPV and HPV vaccine knowledge, (b) desire for more HPV vaccine information, and (c) preferred source of HPV and HPV vaccine related information. The research questions for the study were as follows:

RQ1: How knowledgeable are college students regarding HPV and the HPV vaccine?

RQ2: Do college students desire HPV and HPV vaccination information?

RQ3: From which sources do college students want to receive information about HPV and the HPV vaccine?

Method

This study utilized a nonexperimental, cross-sectional design with a non-probability based convenience sample of unvaccinated college students. The sample was comprised of college students between the ages of 18-26. One requirement of participants was that they had to have heard of the HPV vaccine prior to participating in this study. The research team deemed that it would be exceedingly difficult for respondents to provide responses to questions about a vaccine they had never even heard of. Students were recruited from a large university in the Southeastern region of the U.S. during Spring 2016. The study was approved by the university's Institutional Review Board. The study utilized descriptive statistics and frequencies to answer the research questions. Kuder-Richardson Formula 20 was computed to assess internal consistency of the HPV Knowledge and HPV Vaccine Knowledge Scales.

Procedures

Instructors of undergraduate communication courses were contacted via email with a request that they voluntarily distribute the study via email to their students. A total of seven courses received an invitation email that included information about the study and a link which directed participants to the web-based survey. Instructors were asked to offer extra credit to students for completing the survey which was hosted online through Qualtrics. Students who did not want to participate in the survey, but still wanted an opportunity to earn extra credit were offered a time-equivalent alternative activity that would award the same amount of extra credit. Each survey response was anonymous, and students could complete it in any location with Internet access. Individuals could withdraw from the study without a penalty at any point. Upon receiving the email, participants were able to click on the included survey link where they were first taken to the informed consent portion of the survey. If they chose to move forward and indicate their consent, the next page was the survey. In order to provide a list for awarding extra credit, the participants were taken to a separate survey after completing the survey measures. For those who were ineligible (e.g., had not heard of HPV), they were immediately taken to the extra credit survey so they would be rewarded for their participation. This survey allowed participants to input their information without it being linked to their HPV/HPV vaccine survey responses. The survey was available during February 2016.

Measures

HPV vaccine uptake. A single item was used to assess HPV vaccine uptake and asked, "Have you received the HPV vaccine?" with "yes", "no", or "I don't know" as response options. It is not likely that the participants would have received the HPV vaccine without their knowledge, so those who answered with "I don't know" were coded as unvaccinated. This measure intended to capture whether students had received one or more doses of the HPV vaccine.

Descriptive measures. Questions related to gender, age, race, prior HPV diagnosis, current or previous partner HPV diagnosis, relationship status, sexual orientation, and whether they received information from their university were included.

Knowledge. Two scales were used to measure participant knowledge as it related to the HPV vaccine and to HPV itself. Items were modified from previously validated General HPV Knowledge and HPV Vaccination Knowledge scales (Waller et al., 2013). Waller et al.'s (2013) instrument was tested and validated with a random subset sample of men and women ages 18-70 years living in USA, Australia, or UK recruited through Survey Sampling International, an online survey research company. These measures were collected and adapted from quantitative studies of HPV knowledge that were published between 1992 and 2009 ($n = 56$). The full instrument consisted of 29 items (three subscales) and had a Cronbach's alpha value of 0.84 ($n = 648$) and a test-retest value of 0.79 ($n = 226$). The General HPV Knowledge subscale consisted of 16 items and had a Cronbach's alpha value of 0.849 ($n = 1473$). The HPV Vaccination Knowledge subscale consisted of 7 items and had a Cronbach's alpha value of 0.561 ($n = 1165$). We did not utilize Waller et al.'s (2013) HPV Testing subscale as HPV testing does not assist with primary prevention of HPV, is not approved by the U.S. Food and Drug Administration for clinical use in men, and did not fit within the scope of the study.

For the purpose of this study, general HPV knowledge was defined as a broad understanding of facts specific to HPV, including (a) possible health outcomes of HPV (b) symptoms, (c) causes, risk factors, and transmission, (d) methods of prevention, (e) prevalence, and (f) treatment. The General HPV Knowledge scale consisted of 15 true/false questions, with each item scored as correct (1) or incorrect (0) for a possible score range of 0-15. Some of the items were "Men cannot get HPV", "HPV can cause oral cancer", and "HPV always has visible signs or symptoms". For this study, HPV vaccine knowledge was defined as general comprehension of facts specific to HPV vaccination, including, (a) current HPV vaccine recommendations, (b) vaccines available, and (c) disease prevention. The HPV Vaccination Knowledge scale had 8 true/false questions and each item was scored as correct or incorrect for a possible score range of 0-8. Some of the HPV vaccination questions were "The HPV vaccines offer protection against most cervical cancers", "Someone who has had the HPV vaccine cannot develop anal cancer", and "The HPV vaccines offer protection against all sexually transmitted infections."

Desire for HPV related information. Each participant was asked "Are you interested in learning more about the HPV vaccine?" with possible response options of "yes" or "no".

Preferred information source. Each participant was asked who they would want to deliver HPV related information and they were able to choose as many sources as they wanted from a predetermined list. This list included, parent(s)/legal guardian(s), non-parent family member, friend, primary care provider, health educator, professor, and other. If they chose the "other" option they were given a textbox to write in their desired source(s) of information.

Results

In total, 497 college students were contacted to participate in the study. The current study was focused only on those who had yet to receive any shot in the HPV vaccine series. This resulted in a total of 114 unvaccinated participants with 73 (64%) females and 41 (36%) males ranging from 18-26 years old. The majority (93%) of the sample was between 18 and 22 years old. Relationship status was evenly split between not being in a relationship (51%) and in a

relationship (49%). Slightly over ten percent (10.7%) of the sample indicated that they had been told by their primary care provider that they had HPV. The majority of the sample was straight/heterosexual (90%), with asexual (6%), and bisexual (3%) being the only categories garnering over one percent of the population. The racial breakdown was 78.6% White, 11.6% Black, 5.4% biracial/multiracial, 2.7% Hispanic/Latino/a, and 1.8% Asian or Pacific Islander.

Knowledge

Overall, the sample correctly answered 58% ($M = 8.74$, $SD = 4.02$) of the items on the General HPV Knowledge Scale with a possible score range of 0-15. On the HPV Vaccine Knowledge Scale, the sample correctly answered 63% ($M = 4.44$, $SD = 2.15$) of the items out of a possible score range of 0-8. The General HPV Knowledge and HPV Vaccination Knowledge scales were internally consistent with Kuder-Richardson Formula values of .871 and .700, respectively. Table 1 includes all of the questions and the percentage of correct answers for the HPV Knowledge Scale.

Table 1

General HPV Knowledge Scale (N = 114)

Question	% Correct
HPV is very rare. (False)	42.1
HPV always has visible signs or symptoms. (False)	38.6
HPV can cause cervical cancer. (True)	73.7
HPV can be passed on by genital skin-to-skin contact. (True)	57.0
HPV can be passed on during sexual intercourse. (True)	84.2
HPV can cause genital warts. (True)	63.2
Men cannot get HPV. (False)	22.8
Using condoms reduces the risk of getting HPV. (True)	64.9
HPV can be cured with antibiotics. (False)	52.6
Having many sexual partners increases the risk of getting HPV. (True)	83.3
HPV usually does not need any treatment. (True)	5.3
Most sexually active people will get HPV at some point in their lives. (True)	30.7
A person could have HPV for many years without knowing it. (True)	73.7
Having sex at an early age increases the risk of getting HPV. (True)	59.6
HPV can cause oral cancer. (True)	34.2

Note. The correct answers are listed in parentheses next to each item. The items were modified from Waller et al.'s (2013) General HPV Knowledge and HPV Vaccination Knowledge scales

The questions where participants lacked knowledge were related to whether HPV needed treatment, if men could get HPV, and whether most people will contract HPV during their lifetime. As for HPV vaccine knowledge (Table 2), protection from cervical cancer and protection from genital warts by the vaccine were the most frequently missed questions.

Table 2

HPV Vaccine Knowledge Scale (N = 114)

Question	% Correct
HPV vaccines require three doses (shots). (True)	84.2
The HPV vaccines offer protection against all sexually transmitted infections. (False)	39.5
The HPV vaccines are most effective if given to people who have never had sexual intercourse. (True)	36.8
Someone who has had the HPV vaccine cannot develop cervical cancer. (False)	31.6
The HPV vaccine offers protection against most cervical cancers. (True)	44.7
Two of the HPV vaccines offer protection against genital warts. (True)	32.5
Girls who have had the HPV vaccine do not need Pap test/Smear test/Pap smear test when they are older. (False)	36.0
Someone who has had the HPV vaccine cannot develop anal cancer. (False)	47.4

Note. The correct answers are listed in parentheses next to each item. The items were modified from Waller et al.'s (2013) knowledge about human papillomavirus scale.

One point of clarification is needed about the third item on the HPV Vaccine Knowledge Scale: "HPV vaccines require three doses (shots)". At the time of data collection (February 2016), three shots of the HPV vaccine were recommended for all age groups, so the correct answer choice would have been "True" regardless.

Information Sources

Nearly two-thirds (60%) of participants had not used the Internet to find information related to the HPV vaccine and 36% were interested in learning more about HPV. Most of the students (63%) reported not previously receiving any HPV related information from their

university. Receiving HPV information from the school was not well received as 27% indicated that they would want their university to provide this information.

Survey respondents who indicated that they were interested in learning more about HPV were given a list of potential sources of HPV related information and could choose more than one source. The preferred sources were primary care provider (30.4%), health educator (26.1%), parent(s)/legal guardian(s) (14.8%), professor (9.6%), family members other than parent(s)/legal guardian(s) (7.0%), and friend (4.3%).

Discussion

Our findings that indicated college students lacked knowledge surrounding HPV and HPV vaccination are fairly consistent with the literature (Johnson & Ogletree, 2017; Ratanisiripong et al., 2013). Overall, the participants answered 58% of the HPV knowledge questions correctly and 63% of the HPV vaccine knowledge questions correctly. These results reveal considerable deficits in HPV and HPV vaccine knowledge.

Over one-third of students in the study were interested in learning more about HPV. The majority of the sample may believe that they have adequate knowledge about HPV and HPV vaccination and therefore are not interested in receiving further information. According to the results of the knowledge measures, this is not the case and college students would benefit from additional information on HPV and HPV vaccination. Therefore, it is important to not only communicate information to college students about HPV and the HPV vaccine, but also about the need for such information. It is possible that college students' misperception of the degree of knowledge they possess is negatively contributing to their perceived need for more, or correct, information. Our results point to the role perceived need plays in information-seeking behavior. As a first step to developing effective campaigns, communication efforts should aim to convince college students that HPV related information is relevant and necessary to their health. Campaigns should appeal to both social and personal motivation, which according to the IMB model, can increase health promotion behavior. In turn, they may be more motivated to learn about HPV/HPV vaccination, which could lead to seeking out related information, and subsequently, an increase in HPV/HPV vaccination knowledge and confidence in discussing the matter with their healthcare provider (Romo, Cruz, & Neilands, 2011). Communicating knowledge about the HPV vaccine should frame information as self-protection.

The current study identified whom college students prefer to communicate with about important HPV and HPV vaccine related information. The most popular information source was a primary care provider. This finding is not surprising as research supports that college students trust their doctor to provide HPV vaccination information (Rosenthal, Weiss, & Zimet, 2011), which is consistent with the average adult (CDC, 2017). Although primary care providers were identified as the preferred source for HPV/HPV vaccine information, many college students study away from home and may not have found a provider near their campus. They should be encouraged to find and visit a local provider. Due to the distance from their primary care provider and potential difficulty in finding a provider near campus it is paramount that other, less preferred sources, are not ignored. The next most highly rated source of HPV information was a health educator. This finding presents an opportunity for college campuses to provide HPV/HPV vaccine information to students through a health educator. This is a natural fit as many universities employ health educators, and in some cases, universities offer student-led peer education health programs. Although most students did not want to receive HPV/HPV vaccine

information from their university directly, universities have the option to host a health educator, unaffiliated with the institution, who could positively influence intentions by being a trusted source of information. This could be accomplished through health education classes, during visits to the student health center, or through health communication campaigns led by health educators external to the university. Finally, the third rated source was parent(s)/legal guardian(s). This finding illustrates the important role parents can serve in communicating with their college-age children about HPV/HPV vaccination. At this stage, many young adults may appear independent, but they likely rely on their parent(s)/legal guardian(s) to help them make important health decisions (Katz et al., 2011).

Both primary care providers and health educators have the expertise and the trust factor that can influence HPV vaccine intentions (Beshers et al., 2015; Johnson & Ogletree, 2017; Patel et al., 2013). Parent(s)/legal guardian(s) may not be experts on the topic of HPV, but they are often a trusted source and are likely to provide health insurance for their child (Katz et al., 2011). These three salient groups should work independently and collaboratively to increase college students' HPV vaccination rates. Primary care providers, health educators, and university health centers should share HPV and HPV vaccination information factsheets that include potential discussion points with parent(s)/legal guardian(s) of college students. This would allow parent(s)/legal guardian(s) to be informed and understand that they have the potential to play an important role in their child's HPV related decisions. Professional preparation programs for primary care providers and health educators should emphasize collaboration and a multidisciplinary approach to address health issues such as HPV vaccine uptake. Factsheets and information sources designed for providers and for health educators should highlight the potential to work with other professionals to spread HPV/HPV vaccine awareness and increase HPV vaccination uptake. Additionally, these materials should draw from evidence-based health communication strategies.

Although other studies have mentioned the influence of physicians on college students' decisions to get vaccinated, the current study directly focused on the top-rated information sources among unvaccinated college students. This information should help in the creation of more effective HPV vaccination interventions. With the preferred information sources in mind, sources should employ effective communication strategies that address essential HPV/HPV vaccine content that college students are often misinformed about. Interventions need to be designed with college students' health literacy level, HPV/HPV vaccine knowledge, access to health care, financial resources, and lifestyle choices in mind.

Limitations & Future Directions

This study had a few limitations that should be taken into consideration when interpreting the results. This study utilized a non-randomized sample of college students enrolled in communication courses at one university; therefore, the results are not necessarily generalizable beyond this sample. Future studies could extend upon our work by including a state, region, or national sample of colleges/universities to improve external validity. Additionally, the results of this study were based on self-report, which can be subject to social desirability and recall bias. However, these methods were most appropriate given the purpose of this study. Our study operationalized receipt of the HPV vaccine generally, without inquiring about the number of HPV vaccine doses received. Future investigations should assess the actual number of doses received and explore whether there are differences in knowledge based on self-reported doses

received (e.g., 0, 1, 2, 3). Overall, there is great potential for future research in this area. A future study could investigate whether students feel comfortable approaching their parent(s)/legal guardian(s) regarding the HPV vaccine or if they would prefer that their parent(s)/legal guardian(s) initiate the conversation regarding the vaccination. This would allow for greater targeting of messages and could lead to creating conversation prompts for each side of the conversation.

In the current study, students indicated that health educators were one of the preferred information sources for HPV/HPV vaccination information, but the study did not determine whether college students understand who is considered a health educator and where health educators are employed. Entry level health educators are generally responsible for conducting needs assessments, planning, implementing, and evaluating health education/promotion programs, as well as communicating and advocating for health, and serving as a resource for credible health information (National Commission for Health Education Credentialing, Inc., 2015). Health educators are employed in a variety of settings including K-12 schools, worksites, community organizations and public health agencies, healthcare clinics, and colleges/universities. Future studies should ask students more information about health educators. One area for future investigation is to determine if college students would prefer to receive information from a health educator who works at the college/university or a health educator who is employed at the local health department. The same could be said for a primary care provider and it would be beneficial to understand if students prefer to see a provider on campus, at a private practice, at a community health center/public clinic, or at a hospital. Messages could come from primary care providers and highlight knowledge areas where college students are lacking.

Future studies can seek to better understand how messages, senders, and knowledge influence HPV vaccine uptake. Studies should investigate how parents, colleges, and health educators can work together to share information. Understanding the potential collaboration between these groups could greatly increase the amount of accurate HPV related information that students receive. In addition to factual knowledge about HPV and HPV vaccination, future investigations can expand upon this study by exploring heuristics and implicit theories specific to HPV and HPV vaccination (Fisher et al., 2003). Beyond this, future studies should assess easily translatable information such as where and how to receive the HPV vaccine, as well as how to fund it (Fisher, 2012). A final limitation relates to the use of the IMB Model as the study did not conduct elicitation research to identify college students' motivation and behavioral skills related to HPV vaccination. Future elicitation studies should utilize open-ended (e.g., focus groups) and closed-ended tools (e.g., survey) to assess all constructs of the IMB model.

Conclusion

The current study found that the majority of unvaccinated college students in the sample had considerable HPV and HPV vaccine knowledge deficits. Despite inadequate knowledge, most of the sample was not interested in learning more about HPV and the HPV vaccine. College students who were interested in learning more, rated primary care providers, health educators, and parent(s)/legal guardian(s) as their preferred information sources. Based on the information construct of the IMB model, there is a greater chance college students would be vaccinated if they were better informed about HPV and the HPV vaccine. These salient groups should work both independently and collaboratively to overcome the severe knowledge deficits

of college students. Primary care providers and health educators are ideal HPV and HPV vaccine information sources for college students; therefore, future HPV vaccine promotion efforts should consider having primary care providers and health educators initiate related conversations with college-age students. Additionally, primary care providers and health educators may offer HPV/HPV vaccination education to parent(s)/legal guardian(s) so that they are well informed and able to have discussions regarding the vaccine with their child. Through the use of trusted sources there is the potential to increase college student knowledge which along with other factors may increase their intentions to receive the HPV vaccine.

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